CR-91 Event – Shelby County, AL
Preliminary Air Monitoring Summary
September 17, 2016 05:00

Prepared by
Center for Toxicology and Environmental Health, L.L.C. (CTEH®)
On Behalf of Colonial Pipeline

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Introduction

On September 9, 2016, the Center for Toxicology and Environmental Health, L.L.C. (CTEH®) initiated air monitoring in support of response efforts to the gasoline release in Shelby County, AL. This report presents the real-time air monitoring data recorded from September 16 2016 17:00 to September 17, 2016 05:00 CDT.

Real-Time Air Monitoring[1]

Real-time air monitoring was conducted to evaluate the potential airborne presence of gasoline-associated constituents, if any, during response operations. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as total volatile organic compounds (VOCs), oxygen, benzene, and flammability as the percent of the lower explosive limit (LEL) using remote telemetering RAESystems® AreaRAEs, hand-held instruments such as RAESystems® MultiRAE Pro/Plus' and UltraRAEs, as well as Gastec® colorimetric detection tubes.

During this monitoring period, four benzene and six VOC action level exceedances were recorded during worker activity monitoring, including instantaneous VOC and benzene readings which were recorded above the action level. When necessary, workers egressed the area in accordance with the approved sampling and analysis plan.

Table 1, below, presents the results of real-time air monitoring using hand-held instruments. Maps of the incident site location and locations of hand-held real-time air monitoring readings are provided in Appendix I.

[1] *Real-time air monitoring refers to the use of hand-held instruments that provide near-instantaneous readings of an airborne chemical concentration without the need for laboratory analysis.*

Table 1: Hand-Held Real-Time Air Monitoring Summary[1]

September 16, 2016 17:00 to September 17, 2016 05:00

Location Category	Analyte	Instrument	Count of Readings	Count of Detections	Range of Detections[2,3]
Worker Activity Monitoring	Benzene	UltraRAE	35	5	0.5 - 1.9 ppm
	%LEL	MultiRAE Plus	58	0	<1 %
		MultiRAE Pro	46	0	<1 %
	O_2	MultiRAE Plus	3	2	20.9 - 20.9 %
		MultiRAE Pro	2	2	20.9 - 20.9 %
	VOCs	MultiRAE Plus	57	2	1.7 - 1.7 ppm
		MultiRAE Pro	57	16	0.2 - 159 ppm
Site Characterization	Benzene	UltraRAE	4	1	11.05 - 11.05 ppm
	LEL	MultiRAE Pro	8	5	4 - 25 %
	VOC	MultiRAE Pro	8	8	1 - 512 ppm

[1]Please Note: The data displayed in the above table has not undergone complete QC analysis and is presented in a preliminary format.
[2]Maximum detections preceded by the "<" symbol are considered non-detections below the instrument limit of detection (LoD) value to the right.
[3]Numbers are the raw values, no correction factors have been applied.

During this monitoring period remote telemetering equipment recorded 5445 detections of VOCs above the CTEH established action level of 30 ppm and 45 detections of LEL above the CTEH established action level of 10% (3% as raw values on LEL sensors).

Table 2 (below) summarizes remote telemetering AreaRAE data for this monitoring period. For this reporting period AreaRAE monitoring data may contain drift events[2]. Appendix I and Appendix II include location maps and graphs for remote telemetering data, respectively. [4]

[2] Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.

Table 2: Remote Telemetering Real-time Air Monitoring Summary[1,3]

September 16, 2016 17:00 to September 16, 2016 05:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections[2]
AR01	2A Compressors	LEL	2624	62	1.1 - 8.9 %
		O_2	2624	2624	20.9 - 21.3 %
		VOC	2624	2427	0.1 - 1408.5 ppm
AR03	West of Release Site/Near Stopple 1	LEL	26	0	<1 %
		O_2	26	26	20.9 - 21.5 %
		VOC	26	16	0.2 - 38.5 ppm
AR04	2A Frac Tank Staging	LEL	2453	0	<1 %
		O_2	2453	2453	20.9 - 20.9 %
		VOC	2453	1904	0.1 - 63.7 ppm
AR05	2A Recovery	LEL	630	0	<1 %
		O_2	630	630	20.9 - 21.5 %
		VOC	630	386	0.1 - 117.5 ppm
AR06	East of Release Site/Near Stopple 2	LEL	1993	164	1.2 - 4.2 %
		O_2	1993	1993	20.9 - 22.2 %
		VOC	1993	1642	0.1 - 100.4 ppm
AR07	2B Recovery	LEL	2583	0	<1 %
		O_2	2583	2583	20.9 - 21.1 %
		VOC	2583	1012	0.1 - 142.6 ppm
AR08	Main Staging Area Frac Tanks	LEL	2651	44	1.2 - 22.3 %
		O_2	2651	2651	20.9 - 21.3 %
		VOC	2651	288	0.1 - 947.5 ppm
AR09	Release Site	LEL	1499	2	1.5 - 3.9 %
		O_2	1499	1499	20.5 - 20.9 %
		VOC	1499	1292	0.1 - 131.6 ppm
AR10	On path between Recovery 2A and Recovery 2B.	LEL	2603	0	<1 %
		O_2	2603	2603	20.9 - 20.9 %
		VOC	2603	2572	0.1 - 343.2 ppm
AR11	Main Staging Entrance East of TRG checkpoint	LEL	1976	0	<1 %
		O_2	1976	1976	20.9 - 21.2 %
		VOC	1976	0	<0.1 ppm
AR13	TRG Checkpoint 2 - access to stopple 1, Recovery 2A and 2A Frac Tank Staging Area.	LEL	1214	0	<1 %
		O_2	1214	1214	20.9 - 21.5 %
		VOC	1214	1	1.3 - 1.3 ppm
AR14	Cab of excavator at release site	LEL	1443	0	<1 %
		O_2	1443	1443	20.5 - 20.9 %
		VOC	1443	1443	1.7 - 149.4 ppm

[1]*Please note: The data displayed here has not undergone complete QA/QC analysis and is presented in a preliminary format.*

[2]*Maximum detections preceded by the "<" symbol are considered at the limit of detection (LoD) value to the right.*

[3]*LEL and VOC values are raw values, correction factors have not been applied.*

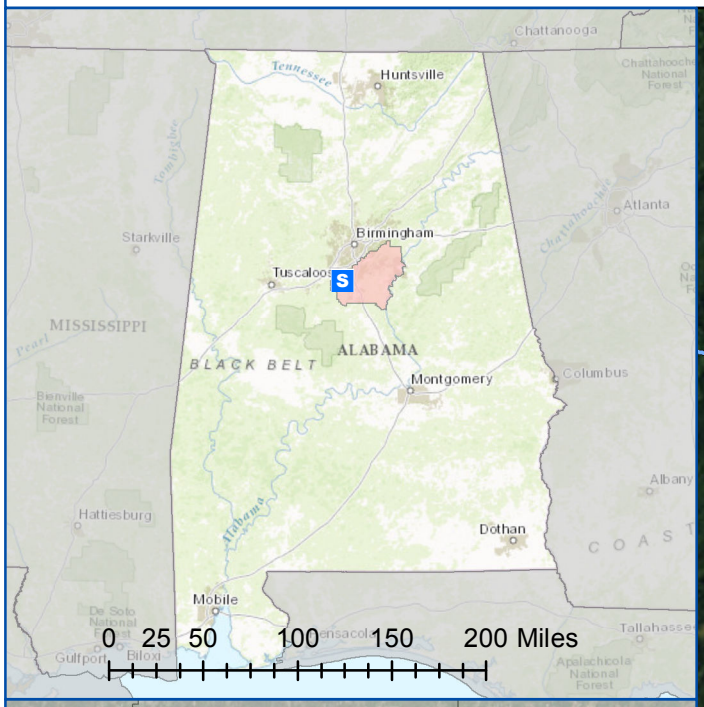
Appendix I:

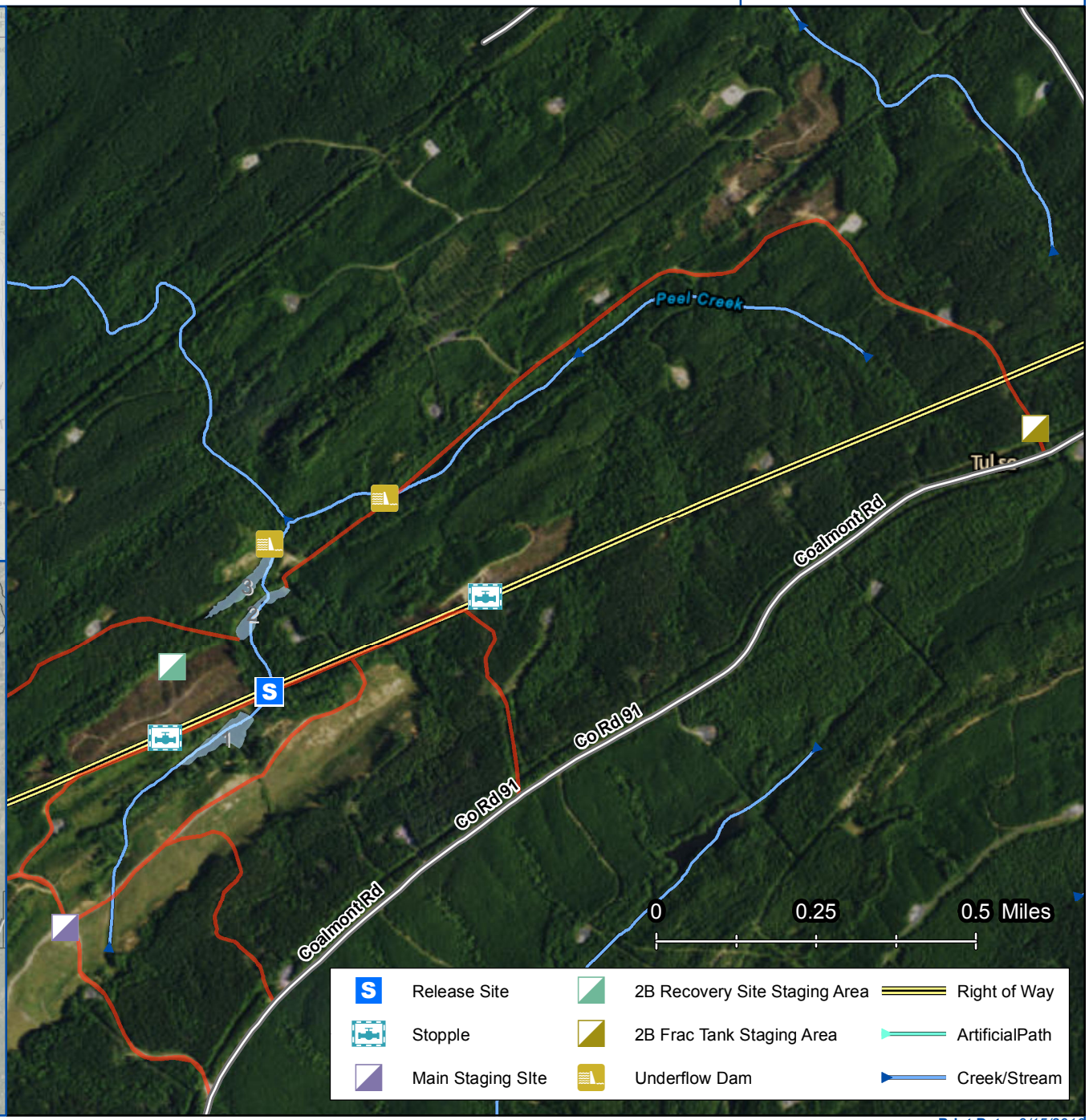
Site Location, Hand-Held Real-Time Air Monitoring Location, and Remote Telemetering Air Monitoring Location Maps

CR-91 Event

Site Location

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



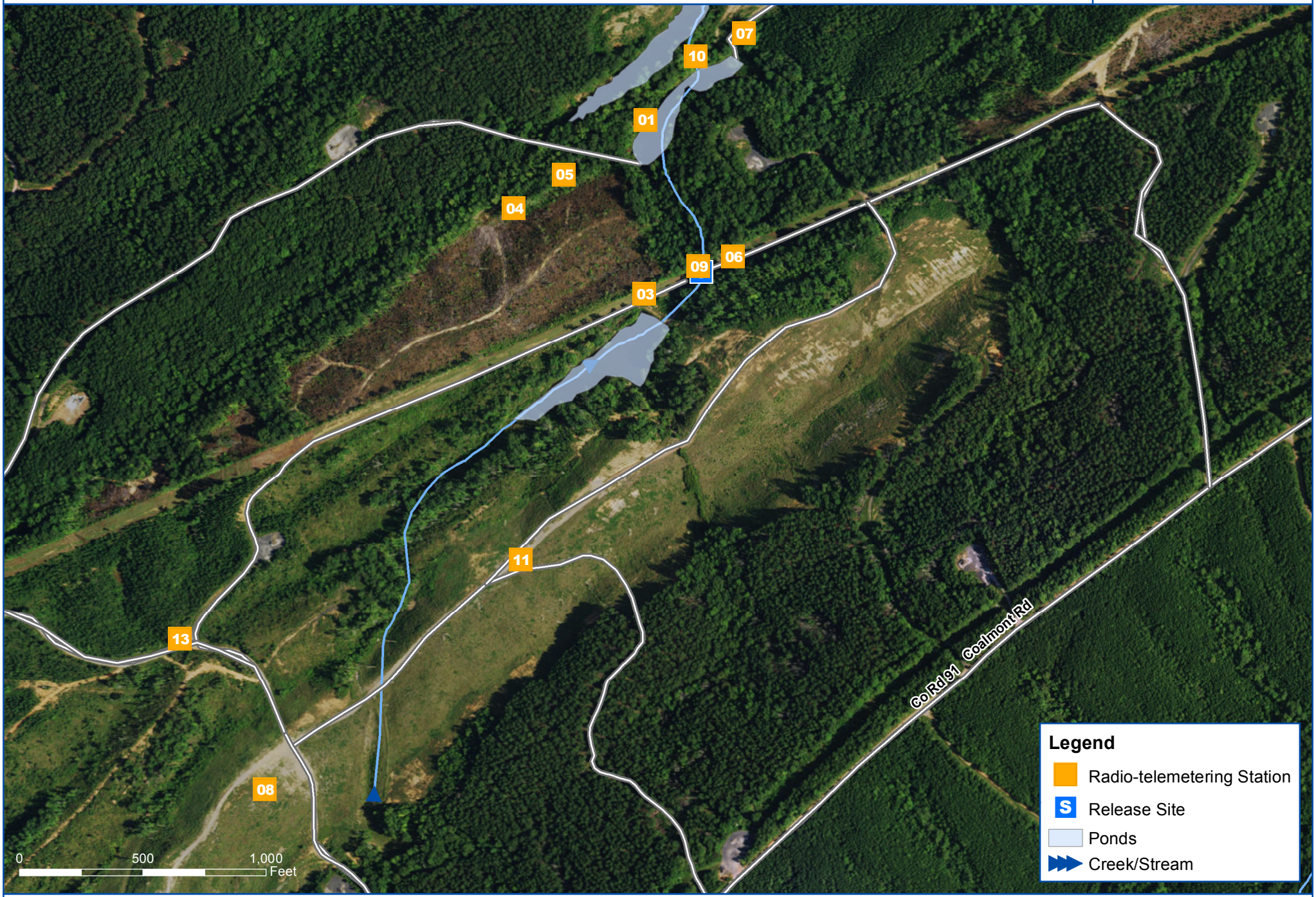


PROJECTION SYSTEM: *UTM16* **COORDINATE SYSTEM:** *WGS84* **Print Date:** *9/15/2016*

Radio-telemetering Real-time Air Monitoring Station Locations

CR-91 Event 9/17/2016

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, LA

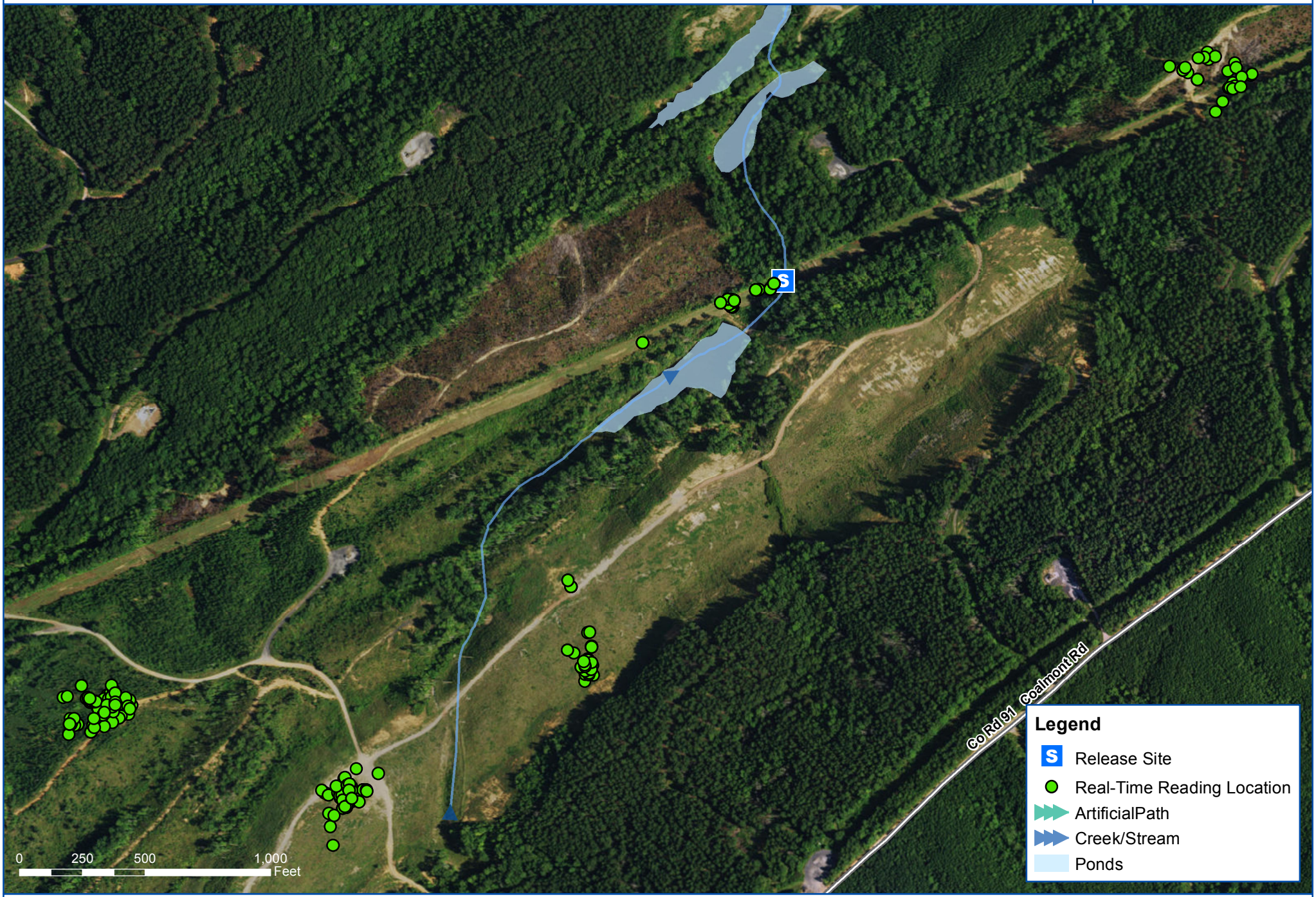


PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84* **Print Date:** *9/17/2016*

Manually-Logged Real-Time Reading Locations

CR-91 Event | 09/16/2016 17:00 – 09/17/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84* **Print Date:** *9/17/2016*

**GPS coordinates are approximate*

Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/16/2016 17:00 – 09/17/2016 05:00

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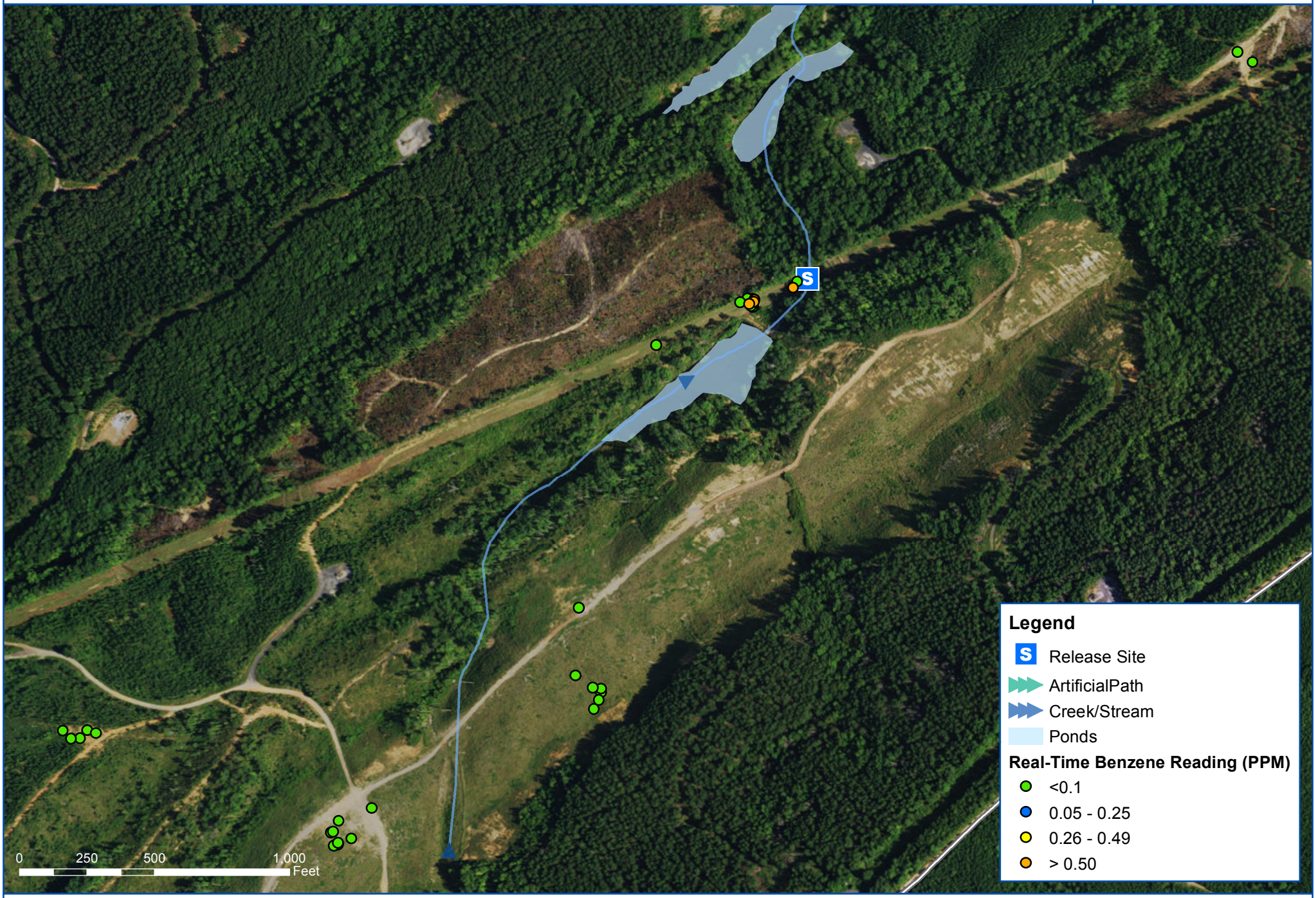
Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84* **Print Date:** *9/17/2016*

**GPS coordinates are approximate*

Manually-Logged Real-Time Readings | LEL

CR-91 Event | 09/16/2016 17:00 – 09/17/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL

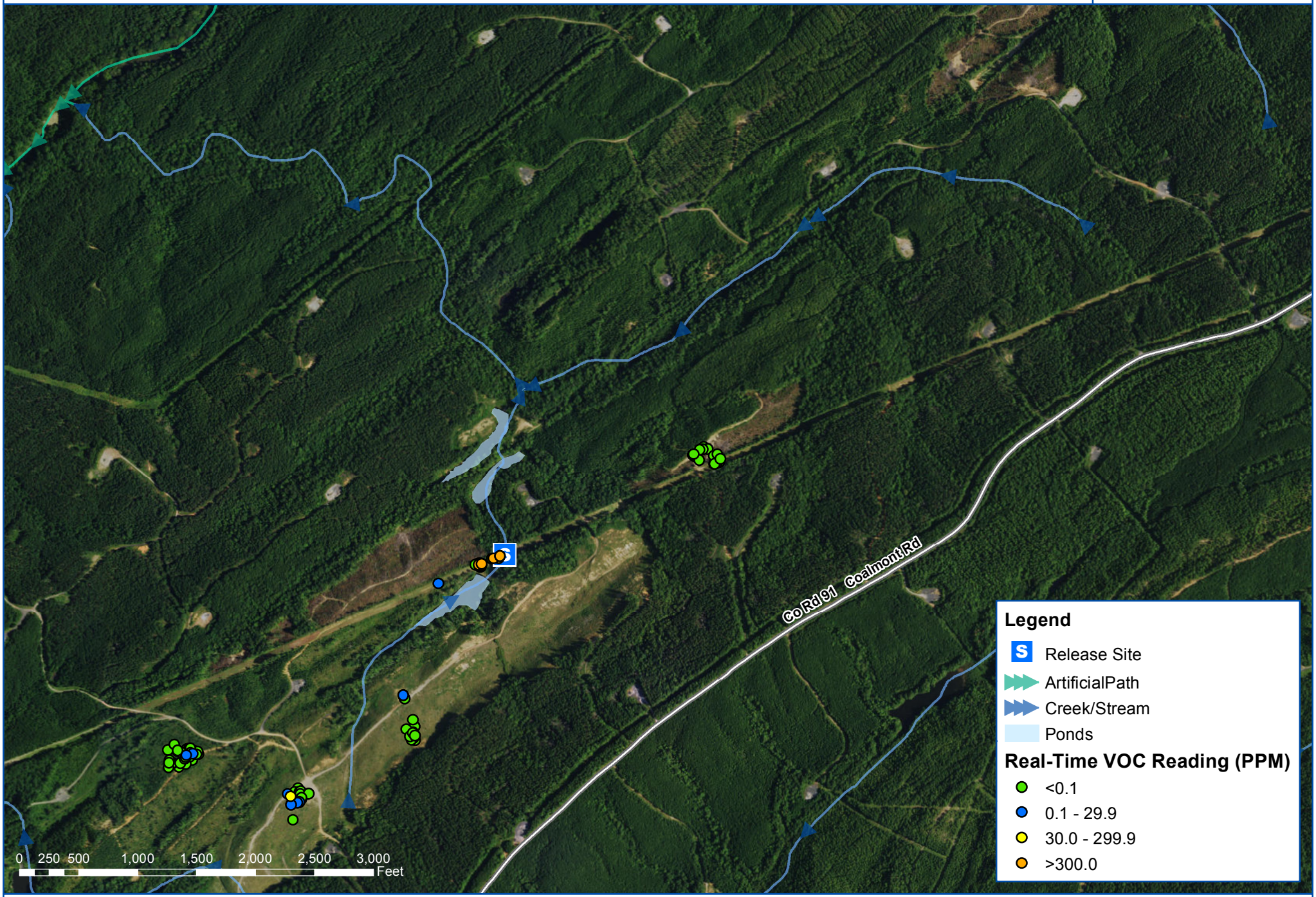
PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84* **Print Date:** *9/17/2016*

**GPS coordinates are approximate*

Manually-Logged Real-Time Readings | VOC

CR-91 Event | 09/16/2016 17:00 – 09/17/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84* **Print Date:** *9/17/2016*

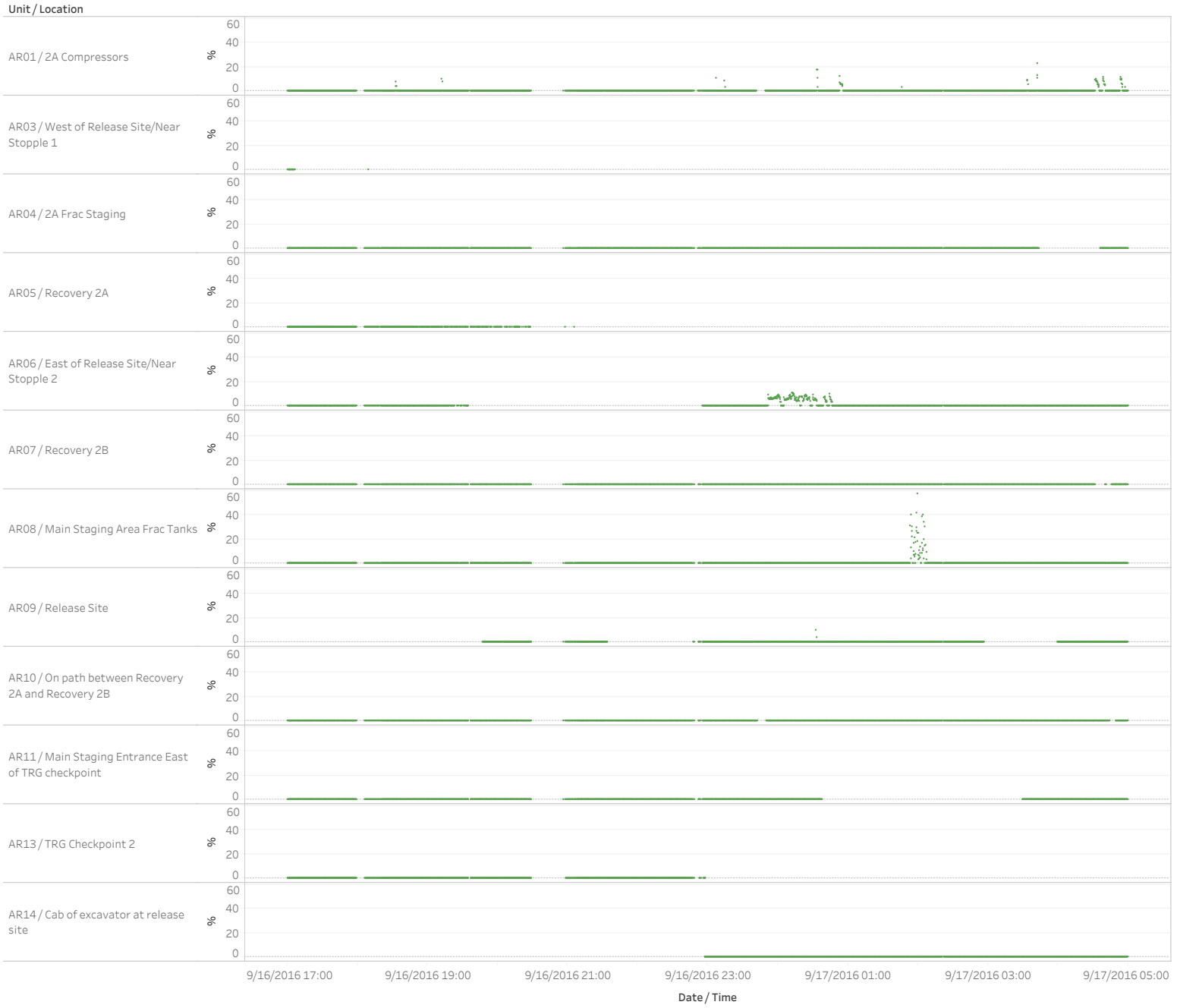
**GPS coordinates are approximate*

Appendix II:

Remote Telemetering Air Monitoring Graphs

Remote Telemetering Real-time Air Monitoring | LEL

CR-91 Event | 9/16/2016 17:00 to 9/17/2016 04:59



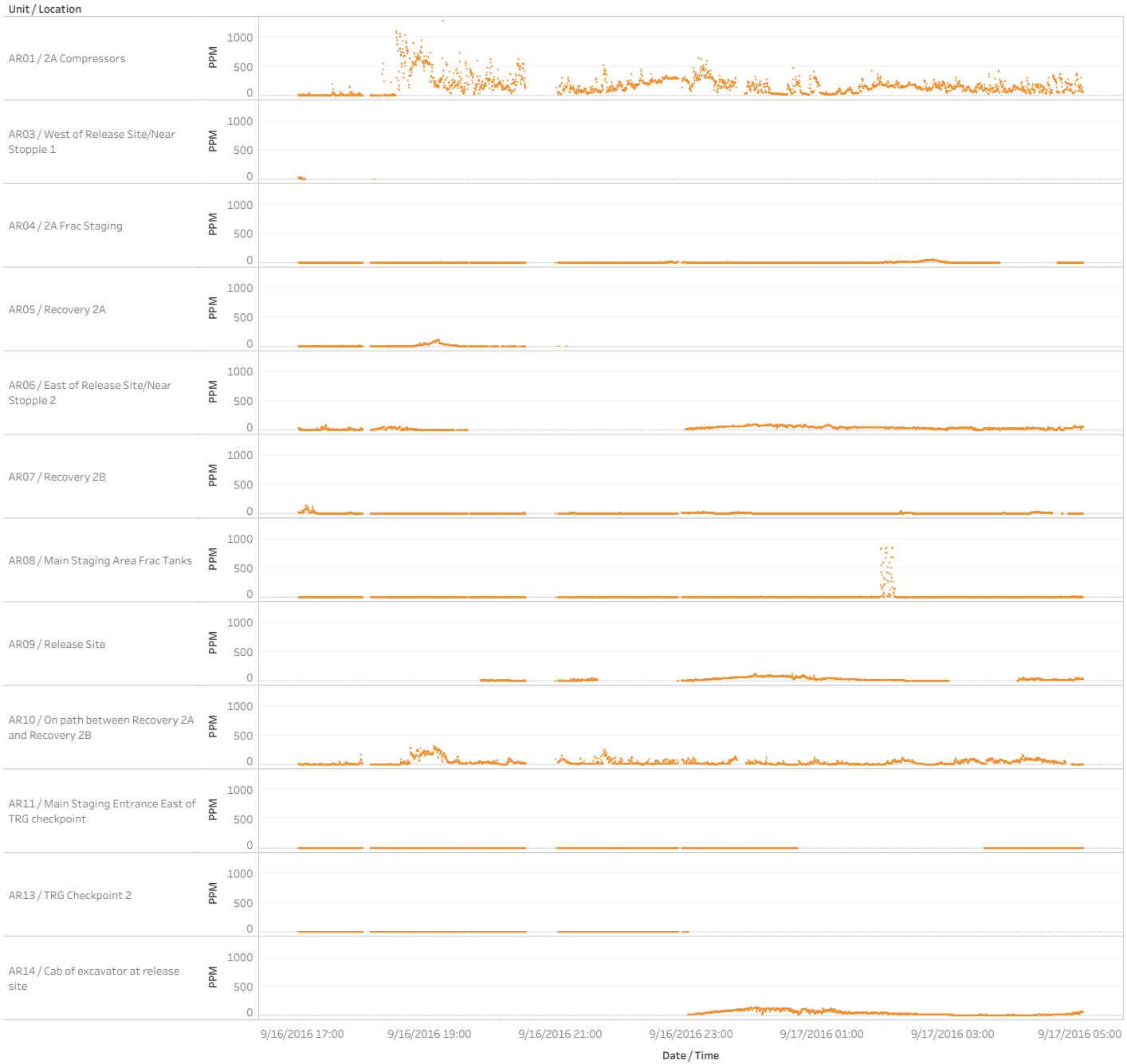
LEL readings are a true representation of atmospheric conditions (appropriate correction factors have been applied to field values).

Remote Telemetering Real-time Air Monitoring | Oxygen

CR-91 Event | 9/16/2016 17:00 to 9/17/2016 04:59

Remote Telemetering Real-time Air Monitoring | VOC

CR-91 Event | 9/16/2016 17:00 to 9/17/2016 04:59



VOC readings are a true representation of atmospheric conditions (appropriate correction factors have been applied to field values).